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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/986,987	11/13/2001	Takanobu Nishida	900-407	6028

7590 02/23/2004  
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Arlington, VA 22201

EXAMINER

OLSEN, ALLAN W

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 02/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	09/986,987	NISHIDA, TAKANOBU	
	<b>Examiner</b>	<b>Art Unit</b>	
	Allan W. Olsen	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 29 November 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 November 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                    | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other:  |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

**Claims 1, 7, 10, 12, 19 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,272,417 issued to Ohmi.**

Ohmi teaches ashing a photoresist layer by using an O<sub>2</sub> plasma. RF energy from one power supply is used to excite the oxygen into a plasma state while a separate power source supplies an RF bias potential to the substrate. Ohmi teaches using an RF plasma source power of 150 W. Ohmi teaches removing the photoresist from an insulating layer. Ohmi teaches that the underlying substrate (i.e. insulating layer) does not sustain damage from the ashing process. While Ohmi does not disclose that the insulating film's dielectric constant does not change by  $\geq 10\%$ , the insulating layer of Ohmi is subjected to the same treatment as the insulating film of the instant claims. Therefore, Ohmi's method and the claimed method are expected to provide the same results. This expectation is bolstered by the fact that Ohmi teaches the substrate is not damaged as a result of an etching process. Therefore, the physical properties of the substrate would not be expected to undergo significant changes. See: column 5, lines 11-18; column 18, lines 36-39; and figure 1.

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**Claim 19 is rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,156,629 issued to Tao et al. (hereinafter, Tao).**

Tao teaches ashing photoresist with an oxygen plasma generated with between 500 and 2000 W of RF energy from a plasma source power supply while a second RF power supply provides between about 100 and 300 W of RF bias power to the temperature controlled pedestal electrode upon which the substrate is supported. These limits of RF plasma source power and RF bias power provide for a source/bias ratio as low as 1.67. See column 8, lines 9-13.

**Claims 19 is rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,440,864 issued to Kropewnicki et al (hereinafter, Kropewnicki).**

Kropewnicki teaches ashing a layer of photoresist with an oxygen plasma generated with between 100 and 5000 W of RF energy from a plasma source power supply while a second RF power supply provides between about 75 and 500 W of RF bias power to the pedestal electrode upon which the substrate is supported.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent Kropewnicki in view of U.S Patent 5,453,157 issued to Jeng.**

Kropewnicki teaches ashing a layer of photoresist with an oxygen plasma generated with between 100 and 5000 W of RF energy from a plasma source power supply while a second RF power supply provides between about 75 and 500 W of RF bias power to the temperature controlled pedestal electrode upon which the substrate is supported. These power limits provide for a source/bias power ratio of as low as 0.2. Kropewnicki teaches a temperature of about 15°C to about 20°C. See: col 2, ln 13-21; col 5, ln 22-25; col 6, ln 55-60; col 7, ln 27, 62-65; col 11 lns 22-25; and col 12 ln 50-52.

Kropewnicki does not explicitly teach that the low-k material is not damaged or that the value of the dielectric constant does not change by more than 10 %.

It would have been obvious to one skilled in the art to conduct the method of Kropewnicki in a manner that did not cause the dielectric constant of the low- k material to change by  $\geq 10\%$  because Kropewnicki teaches the ashing of photoresist from atop a material having a dielectric constant of less than about 3.2 and more preferably less than about 3.0. As such, the dielectric constant of a material with the preferred

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dielectric constant of 3.0 cannot change by  $\geq 10\%$  because this would result in a dielectric constant that exceeds Kropewnicki's upper limit of 3.2

As noted above, Kropewnicki teaches a temperature of about  $15^{\circ}\text{C}$  to about  $20^{\circ}\text{C}$ . While the examiner believes this temperature is recited in reference to the substrate temperature, Kropewnicki is not explicit on this point.

Jeng teaches a method of ashing photoresist etching that overlies a low-k dielectric layer. Jeng teaches that damage to polymeric low-k dielectric materials, such as those of Kropewnicki, can be eliminated by maintaining the temperature of the substrate between  $-20^{\circ}\text{C}$  and  $20^{\circ}\text{C}$  during the photoresist ashing process.

It would have been obvious to one skilled in the art to maintain a substrate temperature of  $20^{\circ}\text{C}$  or less while carrying out the method of Kropewnicki because Kropewnicki is directed to a process of ashing photoresist in the presence of low-k dielectric materials and Jeng teaches that damage to the dielectric material can be eliminated by maintaining a low substrate temperature. Even if the skilled artisan does not presume that Kropewnicki's teaching of a  $15^{\circ}\text{C}$ - $20^{\circ}\text{C}$  temperature is directed to the substrate temperature, the skilled artisan would, nevertheless, be motivated to use the low substrate temperature of Jeng because Jeng teaches that this eliminates damage to the low-k material, which in turn eliminates the prospect of bringing about deleterious changes in the value of the dielectric constant.

Regarding claim 15, Kropewnicki does not teach the formation of a protective film on the surface of the insulating film. However, like Applicant, Kropewnicki teaches using a silicon-containing organic polymer as the low k insulating film. Applicant's

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specification (page 10) attributes the formation of protection film to the migration of silicon to the surface to react with the reactive oxygen species generated from the plasma. Kropewnicki does not discuss this aspect of the claimed invention, nevertheless, the claimed protective film must also be present in Kropewnicki.

### ***Response to Arguments***

Applicant's arguments filed September 29, 2003 have been fully considered but they are not persuasive.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (e.g., protection of an interlayer insulating film and avoiding bonding that would change the dielectric constant) are not recited in the rejected claims. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Additionally Applicant's argue that "[t]he applied references fail to address an ashing operation which consciously prevents a change in the ... dielectric constant". The examiner notes that Kropewnicki's silence regarding the change in the dielectric constant does not establish Kropewnicki's consciousness of the matter, but more importantly, it matters not if the applied references consciously prevented and change in the dielectric constant.

**Conclusion**

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

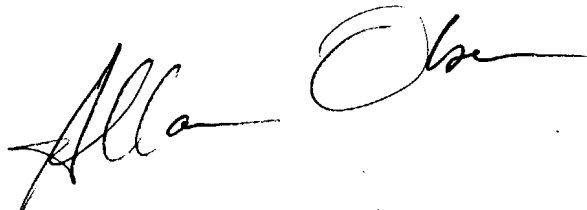
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allan Olsen whose telephone number is 571-272-1441. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Greg Mills, can be reached on 571-272-1439.

The fax number for TC1700 is 703-872-9306 (non-after finals and after-final).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (571) 272-1300.

Allan Olsen, Ph.D.  
December 15, 2003

A handwritten signature in black ink, appearing to read 'Allan Olsen', is written over the typed name and date.